

Figure 1 [see source]

Figure 2 [see source for figure]

Automatic transmission control
unit and first clutch actuator

Second clutch actuator

Power supply

Hydraulic release system

Partially hydraulic release system

Transmission actuator

Engine-side

clutch

Transmission-

side clutch

Figure 3 [see source for figure]

Figure 4 [see source for figures]

Start-up or opening up: severe jolt				
	Time (s)			
Rotational speed (rpm)	Internal combustion engine Asynchronous motor Transmission			
	Time (s)			
Rotational torque (Nm)	Internal combustion engine Engine-side clutch Asynchronous motor Transmission-side clutch			
	Time (s)			

Figure 5 [see source for figures]

Start-up or opening up: severe jolt				
		Time (s)		
	Rotational speed (rpm)	Internal combustion engine Asynchronous motor Transmission		
		Time (s)		
	Rotational torque (Nm)	Internal combustion engine Engine-side clutch Asynchronous motor Transmission-side clutch		
L		Time (s)		

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Figure 6 [see source for figure]

Driver's intent

Simulation of start-up with electrical motor

Drive train coordinator

- Select gear, specify setpoint gear

- Select motor

- etc.

Start-up parameters

Internal combustion engine control

Electric motor control

Transmission control

Clutch control

Control system subprograms relevant to start-up

Figure 7 [see source for figure]

Start	
Start-up with electric motor or standstill with internal combustion engine off	No
Yes	
Pedal value > 0	No
Yes	
Determination of virtual torque of internal combustion engine	Virtual rotational speed of internal combustion engine equal to idle rotational speed
Determination of virtual rotational speed of internal combustion engine	(Creep with electric motor)
Virtual clutch setpoint torque from start-up characteristic map Clutch control	
Send to electric motor control	
End	

Program sequence for computing electric motor start-up torque